

REMARKS

Claims 12-21, 23-28 and 30-34 are presently pending in this application. Claims 23-28 and 30-34 were previously withdrawn. Claims 12-21 have been examined again on the merits.

Applicants submitted a corrected version of Fig. 13 with the Amendment filed on July 1, 2005. However, in the present Office Action, the Examiner did not indicate whether or not the corrected drawing is acceptable. Applicants, therefore, respectfully request the Examiner to confirm receipt and indicate approval of corrected Fig. 13 via the next Patent Office paper.

In the July 1st Amendment, Applicants amended independent claim 12 to recite that the bead portion reinforcing layer (element 34 in Fig. 13, for example) “extends on inner and outer sides of each of said bead cores”. Based on this Amendment, the Examiner removed the previous rejections, and made new prior art rejections. These new rejections are summarized as follows:

1. Claims 12-17 are rejected under 35 U.S.C. §103(a) as being unpatentable over Continental (FR ‘358) in view of JP ‘808, JP ‘905 and Mechanics of Pneumatic Tires (pages 212-213 and 881-884).

2. Claims 18-21 are rejected under 35 U.S.C. §103(a) as being unpatentable over the same references above, and further in view of JP ‘210.

These rejections are respectfully traversed.

Claim 12 is hereby amended to recite at least one plastic deformation region in the wrap part. See original claim 2, as well as the grandparent application, now issued as U.S. Patent No. 6,530,411. Claim 1 of the '411 patent is essentially a combination of original claims 1 and 2.

FR '358 corresponds to UK 1,244,050, a copy of which is attached hereto.

As shown in Fig. 1 of FR '358, the wedge-shaped rubber section 11 is laid so as to abut an extremity of the further steel wire ply 8 (corresponding to the bead portion reinforcing layer) and the abutment region is covered by two further rubber sections 12, 13, whereby the further steel wire ply 8 is adheringly mounted on these rubber sections. FR '358 does not teach or fairly suggest use of a bead filler rubber.

In contrast, the rubber layer of the present invention is arranged between the bead filler and the bead portion reinforcing layer to control the shearing strain therebetween, which is entirely different from the rubber section(s) of FR '358 as to its arrangement, function and effect.

In any case, there would have been no motivation from FR '358 to arrive at the construction of the rubber layer according to the present invention. Since there is no bead filler in FR '358, there is also no need to control shearing strain between a non-existent bead filler and the bead portion reinforcing layer steel wire ply 8.

There is a description of the hardness of the rubber layer at page 2, lines 23-27 of UK '050, i.e.:

“The hardness of the said rubber layer enclosing the steel wire ends in the built-up, but not yet pressed and vulcanized, tyre blank is substantially higher than the hardness of the adjacent rubber layers 15.”

from which it is clear that when the rubber layer is harder than the surrounding rubber at the non-vulcanized state, it becomes naturally harder than the surrounding rubber after the vulcanization. However, as shown in Fig. 3, the region indicated as the adjacent layer 15 includes a bead filler rubber region so that the hardness of the rubber sections is naturally higher than that of the bead filler rubber. Clearly, the provision of a rubber layer as recited in claim 13 that is intermediate in hardness between the bead filler (non-existent in FR '358) and the sidewall rubber (element 15) is neither taught nor suggested by the cited art. Therefore, the Examiner's statement (in the paragraph bridging pages 3 and 4 of the Office Action) regarding the rubber hardness is merely a matter of speculation.

JP '808 discloses that the carcass is comprised of one Kevlar (aromatic polyamide fiber) cord ply wound around the bead core, which is entirely different from the present invention in which the carcass comprised of at least one steel cord ply is wound around the bead core and the wrap part thereof has at least one plastic deformation region. The carcass of Kevlar cord ply cannot form a plastic deformation region.

JP '905 discloses that the carcass ply is wound around the bead core, but the carcass ply is comprised of a tire cord fabric and does not cause plastic deformation, which is thus entirely different from the carcass ply of the present invention.

JP '210 discloses that the outer surface of the tire corresponding to the discontinuous part in the inner structure of the tire is made thick and the neighboring part thereof is made thin to form a concave curve in a lower region of the tire side portion to thereby decrease the shearing strain through tire deformation and improve durability.

In contrast, according to the present invention, the rubber gauge of the bead portion is decreased by making the outside part of the bead portion a concave curve to thereby reduce the heat buildup of the bead portion and improve bead durability, which is different from JP '210 as to its construction, function and effect.

In view of the preceding amendments and remarks, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby earnestly solicited. If there are any points remaining in issue that the Examiner feels may be best resolved through a personal or telephonic interview, he is kindly requested to contact the undersigned attorney at the local telephone number listed below.

AMENDMENT UNDER 37 C.F.R. §1.116
U.S. SERIAL NO. 10/694,907

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The USPTO is directed and authorized to charge all required fees (except the Issue/Publication Fees) to our Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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DRAWINGS ATTACHED

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(54) PNEUMATIC TYRE BLANK

(71) We, CONTINENTAL GUMMI-WERKE AKTIENGESELLSCHAFT, of P.O. Box 169, 3000 Hannover, Federal Republic of Germany; a German body corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention concerns a pneumatic tyre blank wherein either the carcass or bead reinforcement thereof or both comprise(s) steel wires arranged parallel to one another in a rubberised ply.

In a completed tyre of this type, when mounted on a wheel, the steel wires end close to or just above the lip of the wheel rim and since a considerable dynamic stressing of the tyre walls occurs during travel adjacent the lip of the rim this may prove detrimental to the tyre structure.

An object of the present invention is to adhere the steel wire ends to the tyre wall material so that even when the tyre is subject to considerable stresses in use, the tendency of the steel wires to become detached will be at least substantially reduced.

In accordance with the present invention there is provided a pneumatic tyre blank wherein either the carcass reinforcement or a reinforcement in a bead region thereof or both comprise(s) steel wires arranged parallel to one another in a rubberised ply and looped over a bead core and wherein the ends of the looped wires are enclosed by a pre-vulcanised rubber layer. The said latter layer may be formed from a plurality of component rubber sections.

The pre-vulcanised layer formed from the component rubber sections is produced by subsection of the said section to pressure and heat treatment so that a homogenous pre-vulcanised layer in the form of a cover is formed for the steel wire ends or extremities. This pre-vulcanised cover layer has a substantially increased hardness relative to the unvulcanised rubber. Subsequent pressing and vulcanisation of the tyre blank causes the aforementioned

pre-vulcanised cover layer enclosing the steel wire ends to form an intimate bond with the remaining rubber of the tyre body.

In accordance with a preferred feature of the invention a said pre-vulcanised layer is formed in the region of a tyre bead.

Conveniently both carcass and bead reinforcements are provided and only the ends of the wires which extend furthest in the direction of the tread portion of the tyre are provided with a said pre-vulcanised rubber layer.

Conveniently also a said component rubber section of wedge-shaped cross-section is arranged as a continuation of the steel wire ply, the abutment region being surrounded by two further said rubber sections, one on each side.

The invention will be further described, purely by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a partial longitudinal section through a steel wire ply to be used as a bead reinforcement,

Fig. 2 is a plan view of the ply of Fig. 1,

Fig. 3 is a partial radial section through one bead portion of a tyre, and

Fig. 4 is a partial section through a completed, vulcanized pneumatic tyre as shown in Figure 3.

A tyre blank, or a complete vulcanized tyre, is provided with a carcass ply 2 extending continuously from one bead 1 to the other. The carcass ply is made up of rubberised parallel steel wires located in the beads 1 by looping around the bead cores 4. The said steel wires extend substantially at right angles to the peripheral direction of the tyre. A tensile belt 6, extending substantially over the axial width of the tyre tread is provided between the carcass 2 and the tread strip 5.

Each extremity 7 of the carcass ply is overlapped by one extremity of a further ply of steel wires 8 and the other extremity 9 thereof adjacent the inner edge of the bead 1 terminates at substantially the same level as the adjacent said extremity 7.

Each steel wire 8 of the further ply is embedded in a known manner in a rubber

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layer 10. The extremity of this further ply adjacent the outer edge of the bead 1 is treated as shown in Figures 1 and 2. Thus, a wedge-shaped rubber section 11 is laid so as to abut this aforementioned extremity of the further steel wire ply. The abutment region is covered by two further rubber sections 12 and 13, so that a sharply tapered end 14 having a lance-like cross-section is formed. The end of the further steel wire ply shown in Figures 1 and 2 is now compressed under elevated pressure and pre-vulcanized under the action of heat before incorporating the ply into the blank. By so doing, the rubber sections located in the edge region of the further steel wire ply are hardened to an extent which may be between 40% and 80% of its hardness in the completed tyre.

The arrangement of this further steel wire ply with its pre-vulcanised rubber layer comprising rubber sections 11, 12 and 13 adheringly mounted thereon is shown in Figure 3. The hardness of the said rubber layer enclosing the steel wire ends in the built-up, but not yet pressed and vulcanized, tyre blank is substantially higher than the hardness of the adjacent rubber layers 15.

When the tyre blank has been completed, it is vulcanized in a vulcanizing press and has its final shape imparted thereto, a tyre bead 1 outline being produced which is substantially as shown by the broken lines 16. During this treatment of the tyre blank, the layers 15 form an intimate bond with the rubber sections 12 and 13 and with the steel wires 2 and 8. There are also bonds with the layer 10.

The laterally outward end of the steel wire ply 8 in the completed and mounted tyre projects beyond the lip of the wheel rim indicated at 17, so that lateral bulges at the wheel rim lip 17 are prevented.

If, for reasons of construction, no bead reinforcement in the form of the further steel wire ply of wires 8 is to be used, or of the extremities 7 of the carcass ply when a (bead reinforcement) further steel wire ply is provided, project beyond it towards the tyre tread, then said extremities are pretreated in the manner shown in Figures 1 and 2.

It is possible to enhance strength by the incorporation of short fibres, wires or even fabrics, in the rubber sections 11, 12 and 13.

It should also be noted that whilst the steel wires 2 of the carcass ply extend at right angles to the peripheral direction of the tyre i.e. in radial planes including the rotational axis of the tyre, it is preferable for the steel wires 8 which form the further steel wire ply

to extend at an angle to the said radial planes, such that these latter wires are disposed at an angle, preferably 30°, to the steel wires 2.

WHAT WE CLAIM IS:—

1. A pneumatic tyre blank wherein either the carcass reinforcement or a reinforcement in a bead region thereof or both comprise(s) steel wires arranged parallel to one another in a rubberised ply and looped over a bead core and wherein the ends of the looped wires are enclosed by a pre-vulcanised rubber layer.
2. A tyre blank as claimed in claim 1 wherein a said pre-vulcanised rubber layer is formed in the region of a tyre bead.
3. A tyre blank as claimed in claim 1 or claim 2 wherein both carcass and bead reinforcements are provided and only the ends of the wires which extend furthest in the direction of the tread portion of the tyre are provided with a said pre-vulcanised rubber layer.
4. A tyre blank as claimed in any of the preceding claims wherein a said pre-vulcanised rubber layer is formed from a plurality of component rubber sections.
5. A tyre blank as claimed in claim 4 wherein a said component rubber section of wedge-shaped cross-section is arranged as a continuation of the steel wire ply, the abutment region being surrounded by two further said rubber sections, one on each side.
6. A tyre blank as claimed in any of the preceding claims wherein the walls of a said pre-vulcanised rubber layer converge towards the free end.
7. A tyre blank as claimed in any of the preceding claims wherein the hardness of a said pre-vulcanised rubber layer is between 40% and 80% of the hardness of the said layer in the finished and vulcanised tyre.
8. A tyre blank as claimed in any of the preceding claims wherein said pre-vulcanised rubber layer is substantially harder than a rubber layer of the tyre body adjacent thereto.
9. A tyre blank as claimed in any of the preceding claims wherein a said pre-vulcanised rubber layer contains short fibres or wires.
10. A tyre blank as claimed in any of the preceding claims wherein a said pre-vulcanised rubber layer is reinforced with fabric.
11. A pneumatic tyre blank substantially as hereinbefore described and illustrated in the accompanying drawings.
12. A pneumatic tyre, formed from a tyre blank as claimed in any of the preceding claims.

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FIG.1

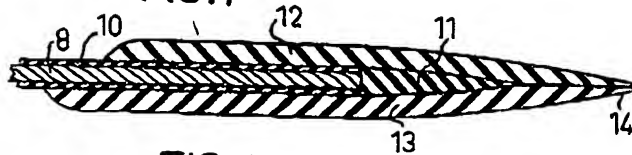


FIG.2

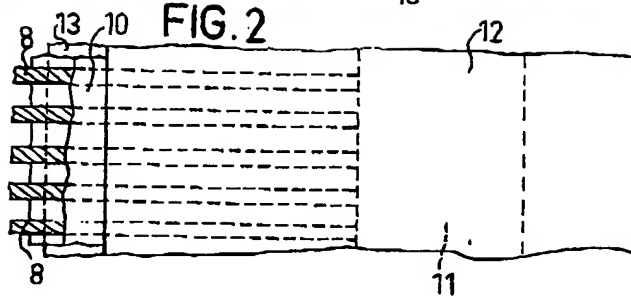


FIG.3

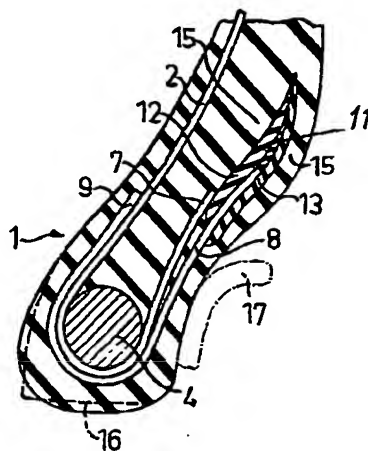


FIG.4

